Loopback Ethernet Reception

Scheme for receiving from self
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The system code supporting networking for the IRM/local station nodes was originally developed when token ring was the controls network. It has now become more usual to use ethernet for front ends. Unlike token ring, ethernet hardware does not listen when transmitting, so that a frame that is transmitted cannot be received by the hardware. This note addresses a scheme for providing support for receiving transmitted ethernet frames that would normally have been received if token ring were the network used.

Stop the presses! There may be an easy way to provide this support. The ethernet controller chip that we use in the IRM is an Intel 80596. In the configuration registers is a two-bit Loopback Mode field in Bits 7–6 of byte 3. From page 4–130 of the user's manual, the following table appears:

00	Looopback off
01	Internal Loopback
10	External Loopback. /LPBK pin not activated.
11	External Loopback. /LPBK pin activated.

By changing the code used from 00 to 10, it seems that the node is now able to receive frames it transmits that are addressed to it. This may solve the problem. If it is this easy, why devise a more complex solution?

A more complex solution may be a bit more efficient, but the future VxWorks-based version of the system code is expected to provide loopback support automatically.

What was the problem?

Acnet devices are each given a source node, which is the front end that can serve data requests about the device. The Vax computers felt nervous about receiving replies from too many front ends at once. To alleviate this concern, our server support scheme was designed to support data requests. (We had a long acquantenance with this kind of logic with Classic protocol.) A single node would be chosen to act as the server for all Acnet data requests in one project, such as Booster HLRF, in which we use node06cf.fnal.gov. Sometimes there are devices that are actually based in the server node. That is where the problem can arise. Suppose an Acnet data request is sent to node06cf that asks for data from two devices, say, one of which resides in node06b1 and the other one resides in node06cf, the server node itself. The server node examines this request and determines that it should act as the server node for this request. (All nodes run the same system code, and any can be a server node for any data request, as appropriate.) The server logic forwards the same request it just received to a multicast address, chosen as an address to which all Booster HLRF nodes listen. On ethernet, this scheme fails, because node06cf will not hear the forwarded request that it sent. Oh sure, it already heard the original request. But it is merely acting as a server for that request, not as a leaf node. As a result, the server code in node06cf will not hear the forwarded request, and thus it will have no way to include its own contrubution to the original request. It will reply to the requesting node, indicating that the data from node06cf is missing.

For the token ring case, this didn't happen, because token ring is capable of hearing frames that it sent, if the address matching logic indicates that it should. It will hear the multicast request from itself, answer itself, and thus prepare to deliver its own contribution to the request, to itself, for inclusion in the complete reply message that is returned to the requesting node.

Here is a test example that illustrates what happens. In this case a one-shot request is sent from node0576 to node0562, asking for data from both node0562 (itself) and node0505. The data shows fromes sent/received to/by node0562.

```
SrcN Size T ^Frame HrMn:Sc-Cy+ms
E0D2 0050 R 165022 1340:09-02+23  From 576: one-shot request for 562/505 data
E072 0062 T 193658 1340:09-02+24  Forward to 9F9 multicast to reach all nodes
E082 0062 R 165622 1340:09-02+25  Receive forwarded request
E082 002E T 1936D4 1340:09-02+25  Send 562 contribution (to itself)
E082 002E R 165C22 1340:09-02+26  Receive 562 contribution (from itself)
E1A1 002E R 166222 1340:09-02+32  Receive 505 contribution (via routers, etc)
E0D2 0032 T 19371C 1340:09-02+33  Send to 576 final result
```

In summary, it seems that the External Loopback option, when applied to the ethernet controller chip configuration, can result in the 82596 acting on ethernet in a manner similar to token ring. Frames sent by a node to a destination address that would normally be received by that node, will in fact be received by that node.